

# Digital Connection

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## Back to Basics

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Happy New Year, and good riddance to 2020. I hope 2021 is a lot more normal. Not everything in 2020 was bad, but far more than usual.

If you have never worked a digital mode, this month's column is for you. The digital age is well upon us, but perhaps you're one of those who hasn't taken the plunge yet. It's been a few years since we've taken a look at setting up a digital station from scratch, so we'll revisit that again this month.

Most of the HF digital activity today consists of brief exchanges of text using FT8 mode, but there is still reasonable activity using PSK31, better suited to ragchews than the very slow and rigid FT8 mode. There are literally hundreds of other HF digital modes: Perhaps you've heard of RTTY or JT65?

I like using PSK31 with beginners, as it is narrowband (31 Hz), works well with weak signals and noise, and it's easy to find activity. On VHF, AX.25 packet is still popular but many other modes (including Digital Voice) compete for attention there. Since I have covered packet and TARPNet networking several times lately, today I'm going to focus on HF digital and PSK31, since if you get that up and running, almost all of the other digital modes (including VHF) use essentially the same setup. I find PSK31 to be a lot more interesting to operate than FT8, but you may find differently.

### Easy Setup

And the drudgery of setting up the station for digital is no excuse. What's the word for easier than easy? Trivial, maybe? Yeah, that's it: Trivial. Just download some software, which almost installs itself, hook up an audio cable from the radio to the computer (or even just use the computer's microphone), and you can listen – all in under 10 minutes. OK, maybe 15 – it takes me

5 minutes alone to get up after fiddling behind the computer these days.

Anyway, PSK31 software: let's keep it simple and use DigiPan, available for download at <http://www.digipan.net/>. If you find you enjoy using DigiPan and want to try other digital modes (or if you aren't running Windows), see the sidebar for two programs I recommend as a next step.

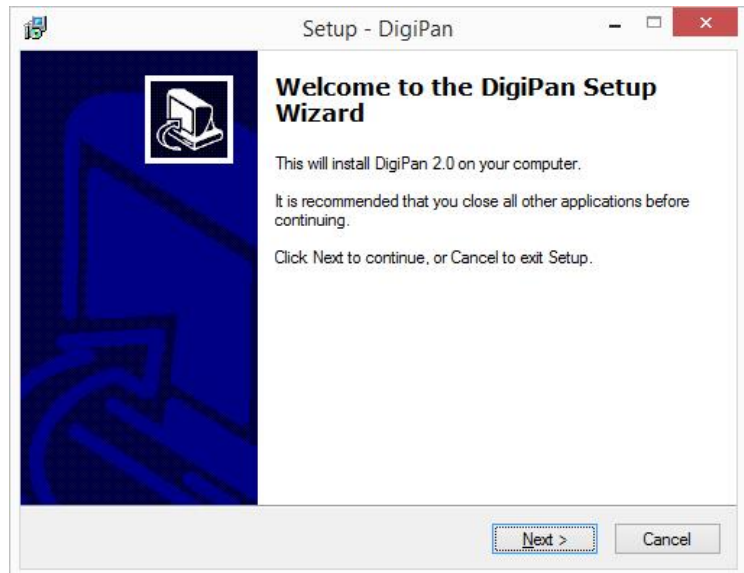


Figure 1: The DigiPan install wizard. Like most any software, DigiPan nearly installs itself, and it takes about a second. You should be OK with all of the defaults, but have the wizard create a desktop icon for you.

### Installation

After downloading DigiPan 2.0, run the .EXE file and click "next" a few times as directed. The defaults are all OK, except be sure "Create a desktop icon" is checked when you see that choice. On my computer, installation took about one second after I clicked "Install".

After launching DigiPan, the first thing is to type in your callsign, name and location (QTH), as shown in Figure 2. After clicking OK, DigiPan should be almost ready to go. If you get an error message (mine said "Sound card in use or does

not exist”), click on the Configure menu. In my case, I hadn’t connected the radio cable yet, and the error went away once I did.

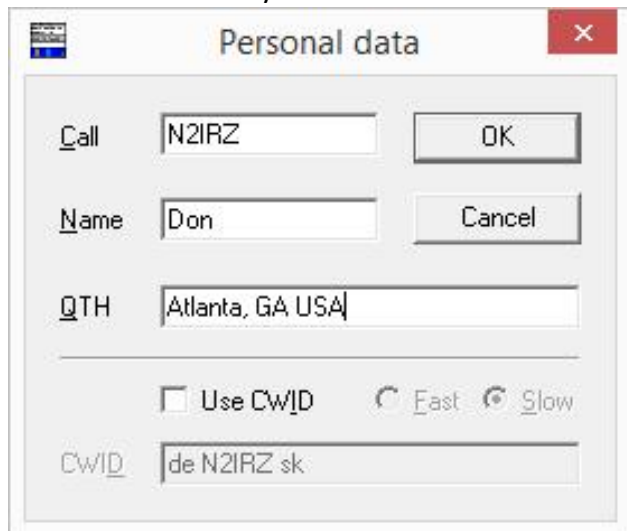


Figure 2: Before you can use DigiPan, you have to fill in the configuration information in this window. It pop up the first time you run the program. You can update this at any time using the Configuration menu.

## Listen First

To listen – which is a good way to start out – just run a patch cable from the headphone (or external speaker) output of the radio to the microphone input on the computer. With the radio connected and on, you should see the noise graphically on the “waterfall” display.

Here’s a neat trick: If you just can’t connect the radio to the computer, just use the computer’s microphone to listen to the ambient sound, and turn up the radio volume to a comfortable level. DigiPan will happily decode PSK31 like that.

The next thing is to find a PSK31 signal. It is a popular mode, so this shouldn’t be too difficult, but it helps to know what you’re looking for, where and how to look. My personal favorite is 40 meters: There’s a watering hole around 7070 kHz where there always seems to be plenty of activity. In general, look near the upper half of the CW portion of the band.

OK, Stop Listening Now...

If you’re trying to find a PSK31 signal, you need to use your eyes as well as your ears. As you tune across the band at about 2 kHz per second, you listen for tones rising or falling in frequency (depending on which direction you are tuning) and, as those tones reach a moderate frequency (maybe 1 kHz, wherever you stop after first hearing it), you pause in tuning for a split second, to look and identify the signal on the waterfall display. You can see and hear Morse code pretty easily, and birdies in the receiver (in my shack, caused by the computer) show up as fairly pure tones. PSK31 has a warbling quality, which I compare to ultra-fast Morse code. You can hear a sample at <<https://bit.ly/3pdCAbc>> (just scroll down a little). On the waterfall display, you see a pair of lines, separated by just a fraction of an inch (corresponding to 31 Hz) that are either very clean or a bit wobbly. Figure 3 shows these, but in practice the signals will be more distinct. Other modes are wider, and have a recognizable pattern to them. Once you’ve decided what kind of signal it is, you can either move on (not PSK31) or tune it in carefully and see who it is. You can also turn off the speaker (assuming you’re using the patch cable) at this point, since hearing a signal doesn’t add any benefit after you’ve found it.

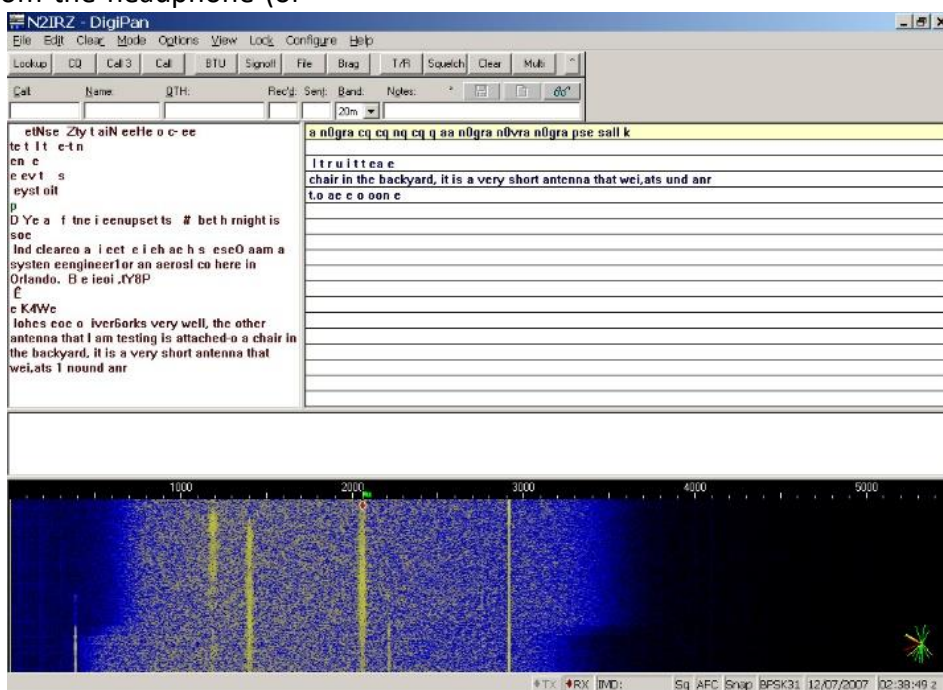


Figure 3: The main DigiPan window, in multi-mode. Top left shows the text being received from the chosen signal (in this case, just above 2000 on the waterfall display), while top right shows the text from all the other signals within the passband. See the text for more details.

Once you find a signal, tune it in by left-clicking on it with the mouse. The little red diamond at the top of the waterfall window will slide over to

the audio frequency where the mouse is pointing, and DigiPan will start to decode it. Alternatively, you can press the right or left arrow keys, and DigiPan will tune over to the next signal it finds if it is strong enough.

## Then Transmit

At this point, you've got all the basics done. If you want to actually transmit, there are three things you need to do: First, get transmit audio from the computer to the radio. Second, set the transmit audio level so you don't overmodulate (this is important!) – the software has instructions for this setting. Third, find a way to control your Push-To-Talk (PTT) line on the radio using the computer. My recommendation for all three is to go online and order a computer sound card-to-radio interface (see Figure 4). There are several brands and models available, at a wide range of price points. Look on the Internet and you can even build one in a half hour.

## Cool Features

While you're waiting for the interface box to show up – remember, this can be expected to work with virtually any digital mode, including on VHF – play around with DigiPan's many features. Let's have a look:

If you find yourself in a part of the band with multiple PSK31 signals, you can toggle into and out of multi-channel decoding mode by pressing F12. In this mode, the main signal you're decoding (and the frequency on which you'll transmit) is indicated by the diamond, and the text appears in the single-channel text box (top left), while the text decoded from each of the signals on the display appears in the multi-channel box, one line per signal, top right. To change to another signal, you can also click on the line in the multi-channel box – this copies the text over to the single-channel window and moves the diamond marker.

One neat feature is the ability to double-click a callsign in the single-channel window (this does not work in the multi-channel window). This captures the callsign so it can be used with the macros and in the log.

DigiPan also has a built-in logging feature. Although not quite contest-quality, it's more than adequate for keeping track of causal QSOs. Double-clicking what looks like a callsign drops it into the callsign field, and double-clicking what looks like a name drops that text into the name field. As you use the macros, the text from these fields can be included, which saves a lot of time. Saving the entry puts it into the log, and you can also search the log for a callsign or enter notes about the entry.



*Figure 4: Connecting the sound card interface is simple: One cable connects to your radio, the other to the computer's audio jacks. Some interfaces use USB to get a PTT signal from the computer, this one just monitors the transmit audio line.*

Macros are probably one of the most useful features in DigiPan. If you're like me, you can type about 15 words per minute, using two or three fingers. If it weren't for macros, I'd be transmitting PSK31 so slowly, it would be almost painful to read. Think about it – PSK31 sends at about 3 characters per second, which translates to roughly 30 words per minute, about twice as fast as I can type. Now, if you can type that fast, you're all set, but for the rest of us hunt-n-peck folks those macros are a lifesaver.

There are 24 macros that can be set up in advance, and any time you press the corresponding macro key, that text is dropped into the transmit buffer. There are buttons in DigiPan that you can click on, and these correspond to the F keys at the top of your keyboard. Twelve of the macros are the straight F keys, and the other 12 are accessed by also holding the <CTL> key.

The most powerful part of the macro feature are the variables that can be used to customize



what is being sent. For example, you can drop in your own callsign, the other station's callsign, the other fellow's name, a dozen more variables and a few dozen commands. Together, these make for a powerful control system, relieving you of the burden of most of the mundane typing.

For example, let's say I want to create a macro to call CQ. I go to the Configure / Fn macros menu and select F1 – this means my CQ macro will fire every time I press the F1 key (even if I'm not ready, so I have to be careful my fat fingers don't accidentally mash the keys...). In the macro edit box, I first type in the label I want to appear for this macro – CQ – and then I enter the macro itself. I enter the command to switch into Transmit mode, then the text I want to send, and finally the command to switch off the transmitter and enter receive mode after clearing text from the receive window. My macro looks like this:

```
<TX>CQ CQ CQ DE <MYCALL> <MYCALL>
<MYCALL> pse K <RXANDCLEAR>
```

The text for <MYCALL> is configured in the Configure / Personal Data menu (along with my name and QTH). <TX> keys the transmitter, and <RX> unkeys it.

There are several common and useful macros you can define. To buy yourself time, build a brag sheet listing the basics of your station. To simplify the end of a transmission, a "BTU" (Back To You) macro can send your callsign, the other station's callsign (taken from the log entry window), signs the QSO back to the other station and goes back to Receive mode – once you've finished typing your regular message, just mash the correct Function key and sit back while the software handles the transaction.

Once you invoke a macro, that text (and any included command) is dropped into the transmit buffer, which is a type-ahead buffer. This means that text (and commands) in the buffer are sent (or executed) as fast as the transmit speed allows (about 3 characters per second), but you can certainly type whatever you want into the buffer as fast as you like. If you're quick, and there's enough text in the buffer, you can even click and edit inside the buffer until it actually transmits those characters.

One of my techniques is to wait for the other fellow to start transmitting. I hit the Call macro, which pops his and my callsign into the TX

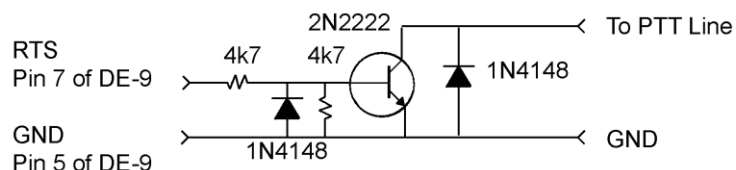
buffer, then I read what he is typing and type out my own response – while still receiving his message. Once the conversation is signed over to me, I toggle into Transmit mode, and the text already in the buffer starts to go out. By that time, I'm almost finished typing in my response to his last few words – when I'm done, I hit the BTU macro to sign the QSO back over, then sit back and relax.

Even though I can only type about half as fast as PSK31 can send, this technique ensures there's almost always something in the TX buffer that's ready to go out. That way, the other fellow doesn't have to sit and wait as my message comes through, one character at a time. I get to have an actual ragchew (instead of just sending my brag sheet) and can make the other fellow believe that I can actually type. Actually learning something about the other fellow, or the town, or county where they live is the most interesting part of Amateur Radio for me. Sure, the details of your station are also interesting, but not as much as the history of where you live, or what you do for a living, or... Well, you get the idea.

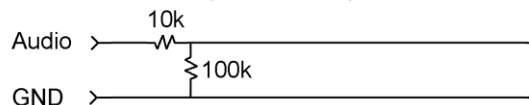
I hope you enjoyed this month's column, and if you actually tried this, let me know! This is a lonely sport sometimes, writing for you. It's always nice to hear from a reader.

Until next time,  
73 de N2IRZ

RS232 PTT Keying Circuit



Optional Audio Attenuator (for RX Audio)



N2IRZ CQ0121

Figure 5: After connecting the sound card output to the audio input of the radio, and the radio's audio output to the sound card's mic input, build this simple circuit to key the radio's transmitter. Although this assumes an RS-232 jack is on the computer, an inexpensive RS-232 to USB converter can be used for newer computers that don't have a serial port. If the receive audio is too loud, the optional audio attenuator can be built.

## Sidebar: Next Step Software

If you enjoyed DigiPan and PSK31, these two well-liked and highly-rated freeware programs are also trivial to set up and offer several different and useful digital modes. My favorite is fldigi, since it has excellent EmComm capabilities and is available for several operating systems. Get W1HKJ's fldigi from <http://www.w1hkj.com/>, or try F6CTE's MultiPSK from <https://bit.ly/38JxYDT>.

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